CHAPTER 1

INTRODUCTION

1.1 Background of Study

Steel is one of the important raw material that is widely used and supplied to the other sectors, such as engineering industry, machinery industry, construction industry, electrical or electronic industry, automotive industry, and furniture industry and it is the main ingredient for infrastructure projects. Malaysia is the fourth largest steel consuming country in ASEAN with a domestic steel consumption of 10 million tonnes in 2014, a marginal growth of 0.3%, driven by the government's mega infrastructure projects, while China ranks first (Malaysia Steel Industry Report, 2015).

The steel consumption in Malaysia has expanded widely over the years in order to become the second largest steel consumer in ASEAN region. According to Malaysian Iron and Steel Industry Federation, MISIF (2015) (Refer Appendix D), Malaysia's total steel demand has been expected to grow significantly about 4% of annual average rate from 2015 until 2018 in accordance with the roll-out of the government's mega infrastructure projects.

The Malaysian iron and steel industries sector cover the primary steel products like direct reduced iron, hot briquetted iron, blooms/slabs and steel billets and a very wide range of downstream flat and long products like hot rolled coils, cold rolled coils, coated steel coils, roofing sheets, steel pipes and sections, steel billets, steel bars, wire rods, wire mesh, hard drawn wires, galvanized wires, steel wire ropes, steel wire products, stainless steel pipes or

pipes fittings and stainless steel wire and fasteners (Malaysian Investment Development Authority, 2017). Apart from that, Malaysian steel industry is focused on the country's construction and the needs of manufacturing. Table 1.1 as illustrated in Appendix E shows the structure of the steel industry in Malaysia in 2008, by product and the number of establishments.

Malaysia Steel Industry Report (2015) published that the iron and steel industry is a core sector that tracks and closely supports Malaysia's overall economic growth, contributing around 4% to the GDP. In the other hand, Malaysian Investment Development Authority, MIDA (2017) mentioned that there are currently 2,190 projects producing the primary steel products with total employment of 160,131 workers.

With the growing number of employments in steel industry, the safety and health of the workers is a concern. The workers who are working in a steel industry often exposed themselves with hot working environment. Basically, steel making is a high temperature process especially at hot rolling area, near the surfaces or at the casting platforms. Yi Wang *et al*. (2016) mentioned that the indoor thermal environment is normally unacceptable in naturally ventilated industrial buildings with high temperature heat sources, such as iron and steel plants and metallurgy plants. As a consequences, the workers in that industry might have health problems and their productivity decrease when directly exposed to the hot working environment.

In 2012, there was an accident occurred at a local steel manufacturing plant, where a worker in furnace division fainted during having his meal, and he was being diagnosed with heatstroke which resulting him to suffer slurred speech and generalised body tremor (Department of Occupational Safety and Health Malaysia, 2016). Other than that, in 2013 and 2014, there were also another three cases reported to DOSH Malaysia regarding to heat-related illness which has caused multiorgan failure. The three cases involved trainees during their field training which was under the hot sun. After further heat stress assessment and enforcement conducted by DOSH Malaysia, it was found that the workers were exposed to heat stress through high temperature process and machinery, and it was also found that both employers and the workers are lack of knowledge as well as awareness about the exposure to heat and its risk to health. The findings from the heat stress assessment and enforcement confirmed that it is very necessary to have standards

or guidelines in order to evaluate the exposure to heat at workplace for guiding the organization and employers in Malaysia.

Department of Occupational Safety and Health, Malaysia (2016) described that exposure to abnormal or prolonged amounts of heat and humidity without relief or adequate fluid intake can lead to various types of heat related illness such as heat rash, heat cramps, heat exhaustion, heat syncope, and heat stroke. Moreover, as the temperature increases, workers may difficult to concentrate and unable to do mental tasks as well as unable to perform skilled tasks or heavy work.

In hot environment, the body needed to remove the excess heat so that it can maintain its normal body temperature. In order to remove or loss the excess heat to the environment, the heart rate increases pumping more blood through the outer parts of body and skin, and then sweating occurs. These changes causing additional demand on the body. A person's ability to perform physical and mental work will be reduced as the blood flow changes and there is excessive sweating. As the environmental temperature increases above 30°C, it can interfere with the mental task's performance.

During their working hours, the workers need to wear a substantial amount of clothing and personal protective equipment (PPE) which can protect them from getting burns or contact with the heat sources. Sometimes, while the clothing and PPE protecting the employee from the heat sources, this type of equipment itself may expose the workers to heat related illness and thermal discomfort to the workers. DOSH, Malaysia (2016) reported that the cases of heat-related illness which occurred among trainees during field training in 2013 and 2014 were caused by inappropriate PPE worn by them. Hence, it is crucial to determine how the clothing contributes to thermal comfort or discomfort by evaluating the level of protection of existing PPE worn by the workers so that their level of thermal comfort can be improved.

This study was conducted at the steel industry which located in Gebeng, Kuantan, Pahang by referring to the Guideline on Heat Stress Management at Workplace 2016. This guideline has been drawn up to provide guidance for the employers in avoiding discomfort from hot environment at workplace.